

# Linear actuator with linear recirculating ball bearing and guideway assembly and toothed belt drive

Tandem actuators  
**MDKUE15-3ZR, MDKUE25-3ZR,  
MDKUVE15-3ZR, MDKUSE25-3ZR**  
Fitting and maintenance manual

# Safety guidelines and symbols

## High product safety

Our products correspond to the current level of research and technology. If the bearing arrangement is correctly designed, if the products are handled and fitted correctly and as agreed and if they are maintained as instructed, they do not give rise to any immediate hazards.

## Statements to be observed

This publication gives descriptions of standard products. Since these are used in numerous applications, we cannot make a judgement as to whether any malfunctions will cause harm to persons or property.

It is always and fundamentally the responsibility of the designer and user to ensure that all specifications are observed and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product failure and malfunction may endanger persons.

## Definition of guidelines and symbols

The warning and hazard symbols are defined along the lines of ANSI Z535.6-2006.

The meaning of the guidelines and symbols is as follows.

**Warning** 

If they are not observed, death or serious injury may occur.

**Caution** 

If they are not observed, minor or slight injury will occur.



If they are not observed, damage or malfunctions in the product or the adjacent construction will occur.

**Note!**

There follows additional or more detailed information that must be observed.

①

Numbers within a circle are item numbers.

□

Squares with a shaded border are placed in front of instructions.

✓

Tick marks indicate preconditions.

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# About this manual

## The purpose of this manual

This fitting and maintenance manual is valid exclusively for the linear actuators stated on the title page.

It describes the secure fitting and maintenance of the linear actuators stated.

## How to use the manual

- This manual should be read carefully in full before starting any fitting or maintenance work.
- The manual must be stored throughout the life of the linear actuator.
- Please ensure that the manual is accessible at all times to the target group.
- The manual must be forwarded to each subsequent owner or operator of the linear actuator or the machine or equipment in which the linear actuator is fitted.

## Note!

The text and illustrations in this manual cover, by way of an example, the linear actuator MDKUVE15-ZR. For an explanation of the design, see page 10.

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

## Target group

The target group of this manual comprises the operator and trained skilled personnel charged with the fitting and maintenance of the linear actuators described.

# Safety guidelines for linear actuators

## Use for the intended purpose

All the linear actuators named on the title page are intended exclusively for moving machine components connected to the carriage.

Any other use is not for the intended purpose and is therefore impermissible. The Schaeffler Group accepts no liability for any damage or loss arising therefrom.

## General safety guidelines

- Any actions and methods that endanger the safety of human beings must not be carried out.
- In all fitting and maintenance work, the following must be observed:
  - all nationally valid and relevant specifications for the prevention of accidents
  - all generally recognised rules of safety practice and occupational medicine.

The linear actuators named on the title page are constructed in accordance with the current level of technology and the recognised rules of safety practice. Nevertheless, while they are being used the user or third parties may be put at risk or the linear actuator and other material assets may be impaired.

## Risk reduction

Risks can be reduced by observing the following points:

- The linear actuator should only be operated if it is free from technical defects.
- The linear actuator should only be used for the intended purpose and with an awareness of safety and hazards.
- If any malfunctions occur that have safety implications, the linear actuator must be stopped immediately and the malfunction rectified by a person with appropriate responsibility.

## Fundamental instructions

The assembly and fitting of the linear actuator as well as the fitting and dismantling of the individual components must only be carried out as described in this manual:

- Carry out the operations in the specified sequence.
- Use the listed tools and fitting accessories correctly.  
Tools and fitting accessories that are unsuitable, damaged or contaminated will impair the function of the linear actuator.
- Screws must only be tightened using a torque wrench and the specified torques must be observed.
- Use rubber hammers only, not metal hammers.
- Do not use pointed or sharp-edged tools.

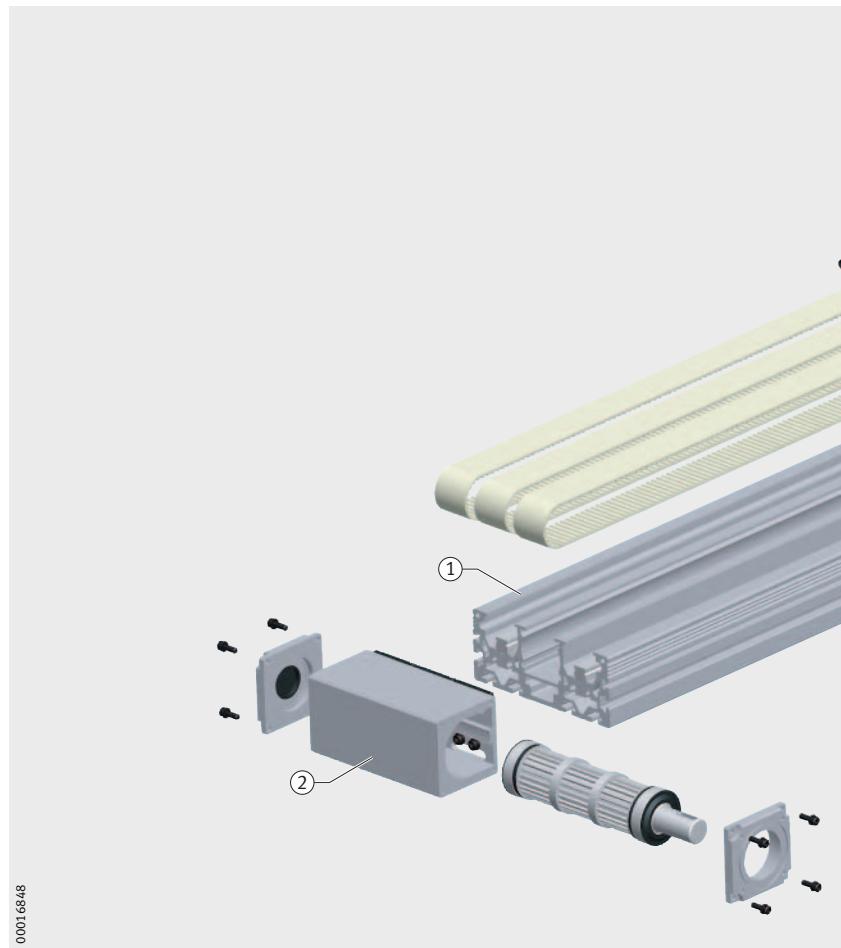
<b>Personnel selection and qualification</b>	Persons charged with the fitting and maintenance of the linear actuator must have adequate qualification. They must receive appropriate training and instruction before carrying out fitting or maintenance work.
<b>Providing information to personnel</b>	The fitting and maintenance manual must be available in a suitable form to the nominated persons (for example as a printout). This includes drawing explicit attention to the hazard and safety guidelines in this manual.
<b>Disclaimer of liability</b>	<p>The Schaeffler Group does not accept any liability for harm to human beings, the linear actuator and the adjacent construction that can be attributed to:</p> <ul style="list-style-type: none"> <li>■ incorrect fitting</li> <li>■ incorrect or inadequate maintenance</li> <li>■ incorrect communication of the content to third parties or a failure to communicate the content.</li> </ul>
<b>Use of replacement parts</b>	<p>Special INA replacement parts have been developed for the linear actuators named on the title page. These ensure the reliable and long term function of the linear actuators.</p> <p><input type="checkbox"/> Do not use replacement parts other than original replacement parts from INA, see page 44.</p>
<b>Use of products from other sources</b>	<p>The use of products from other sources instead of INA replacement parts can:</p> <ul style="list-style-type: none"> <li>■ change the characteristics of the linear actuator in a negative manner</li> <li>■ endanger users or third parties</li> <li>■ cause impairment to the linear actuator and other material assets.</li> </ul>
<b>Disclaimer of liability</b>	The Schaeffler Group accepts no liability for any damage or loss arising from the use of products from other sources.

# Overview of the linear actuator

- ① Support rail with guideways
- ② Drive unit  
(return mechanism on drive side)
- ③ Carriage with linear recirculating ball bearing and guideway assemblies
- ④ Toothed belt unit
- ⑤ Return unit  
(return mechanism on non-driven side)

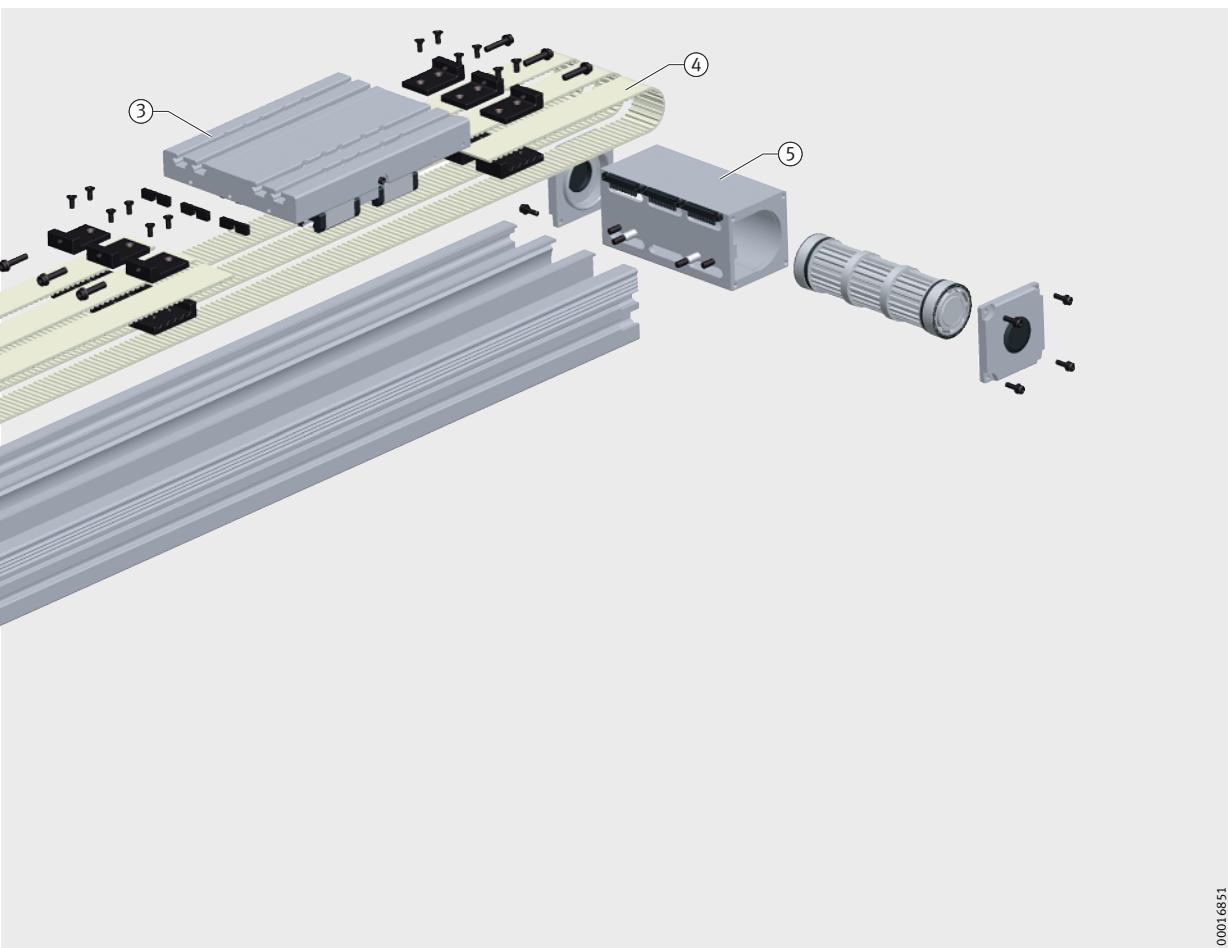
*Figure 1*  
Subassemblies  
of linear actuator MDKUVE15-3ZR

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## Scope of delivery

- Support rail with guideways ①.  
If supplied in several pieces, see section Variants, page 38.
- Drive unit ②.



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**Scope of delivery**  
– continued

- Carriage with linear recirculating ball bearing and guideway assemblies (3).
- Toothed belt unit (4).  
The toothed belt unit comprises three toothed belts and the clamping devices:  
The toothed belts are fixed to the carriage by means of the clamping devices.
- Return unit (5).

# Overview of the linear actuator

## Available designs

**Linear recirculating ball bearing and guideway assembly**

The linear actuators are available in different designs.

Linear recirculating ball bearing and guideway assembly	Series
Two-row	MDKUE
Four-row	MDKUVE
Six-row	MDKUSE

## Carriage

Carriage	Suffix in ordering designation	
Number of driven carriages		
1	–	
2	Variant, see page 40	
Length		
MDKUE15-3ZR	240 mm	–
	500 mm	500
MDKUE25-3ZR	365 mm	–
MDKUVE15-3ZR	240 mm	–
	500 mm	500
MDKUSE25-3ZR	365 mm	–

## Drive system

Drive system	Suffix in ordering designation	
Without drive	OA	
Drive shaft on right side	AR	
Drive shaft on left side	AL	
Drive shaft on both sides (right and left)	RL	
Without drive shaft	OZ	

## Support rail

Support rail	Suffix in ordering designation	
Single-piece	–	
Multi-piece	Variant, see page 40	

## Note!

The text and illustrations in this manual cover, by way of an example, the following design of linear actuator:

- four-row linear recirculating ball bearing and guideway assemblies (MDKUVE)
- one driven carriage 240 mm long
- drive shaft on the left side (AL).

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

The precise design of your linear actuator is dependent on your order.

<b>Ordering designation</b>	The ordering number can be found engraved on the drive unit or return unit.	
<b>Ordering example</b>		
<b>Design</b>	Series with four-row linear recirculating ball bearing and guideway assembly	MDKUVE
Size	15	
Length of carriage	-	
Drive type: triple toothed belt	3ZR	
Drive shaft	AL	
Number of carriages	1	
Support rail	Single-piece	
Total length of actuator	3 000 mm	
Stroke length of actuator	2 546 mm	
<b>Ordering number</b>	<b>MDKUVE15-3ZR-AL/3 000-2 546</b>	
<b>Variants</b>	Variants of the standard designs are shown in the section Variants, see page 40.	

# Fitting in the adjacent construction

The linear actuator is fitted in two steps:

- the support rail is fixed to the adjacent construction
- the carriage is fixed to the adjacent construction.

## Note!

Linear actuators more than 8 m long have a **multi-piece** support rail. They are supplied in several pieces.

- If the linear actuator is supplied in several pieces, please observe the section **Variants**, see page 38.

## Location of the support rail on the adjacent construction

The support rail can be located on the adjacent construction using the following accessories:

- clamping lugs, see page 13
- fixing brackets, see page 13
- T-nuts to DIN 508, see page 14
- T-bolts to DIN 787, see page 14
- T-strips, see page 14
- hexagonal nuts to DIN 934, see page 14.

## Note!

Under normal loads, location by means of clamping lugs, fixing brackets or T-nuts, T-bolts etc. is normally sufficient.

## INA connecting brackets

Multi-axis handling systems comprising INA linear actuators can be constructed using INA connecting brackets.

Detailed information on the connecting brackets can be found in INA publication **Fasteners and connecting brackets for linear actuators (TPI 153)**.



- If linear actuators are located incorrectly, this can damage the linear actuator itself and the adjacent construction.
- Note the maximum tightening torques for the fixing screws.
- Note the maximum spacings for the fasteners.
- Ensure that the adjacent construction has adequate strength.

## Location of the support rail using clamping lugs or fixing brackets

- If the support rail is fully in contact with the adjacent construction, clamping lugs or fixing brackets should be fitted on the left and right sides of the support rail at intervals of max. 333 mm.

MDKUE15-3ZR, MDKUVE15-3ZR:

A = 205 mm

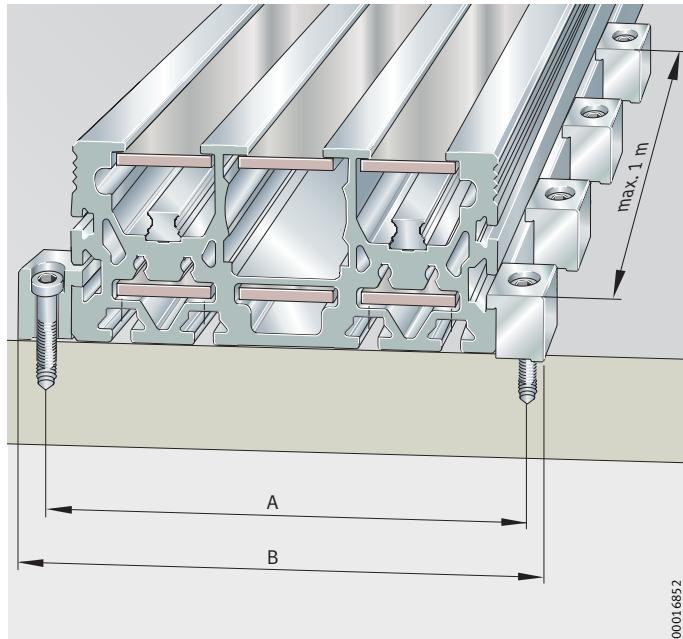
B = 230 mm

MDKUE25-3ZR, MDKUSE25-3ZR:

A = 285 mm

B = 310 mm

*Figure 2*  
Location using clamping lugs



- Under high loads, the support rail should be fixed at shorter intervals or additionally by means of T-nuts or other accessories named on page 12.

## Fitting in the adjacent construction

### Fixing the support rail by means of T-nuts

#### Note!

- If the support rail is fully in contact with the adjacent construction, T-nuts should be fitted in all profiled slots at intervals of max. 300 mm.

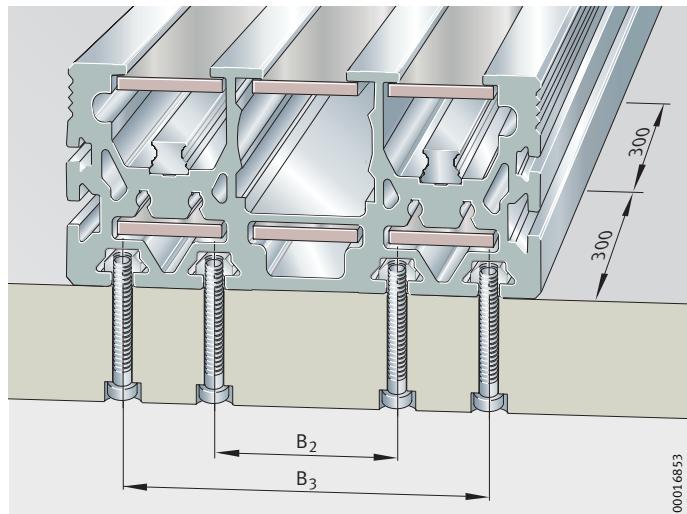
The following accessories can be used instead of T-nuts:

- T-bolts (only MDKUE15-3ZR and MDKUVE15-3ZR)
- T-strips with appropriate spacing of the screws
- hexagonal nuts.

MDKUE15-3ZR, MDKUVE15-3ZR:  
B<sub>2</sub> = 70 mm  
B<sub>3</sub> = 140 mm

MDKUE25-3ZR, MDKUVE25-3ZR:  
B<sub>1</sub> = 50 mm (not shown)  
B<sub>2</sub> = 110 mm  
B<sub>3</sub> = 210 mm

*Figure 3*  
Fixing by means of T-nuts



- Under high loads, the support rail should be fixed at shorter intervals or additionally by means of clamping lugs or fixing brackets.

## **Fixing the carriage to the adjacent construction**

A carriage with T-slots is located by means of:

- T-nuts to DIN 508
- T-bolts to DIN 787
- T-strips
- hexagonal nuts to DIN 934.



If linear actuators are located incorrectly, this can damage the linear actuator itself and the adjacent construction.

- Note the maximum tightening torques for the fixing screws.
- Ensure that the adjacent construction has adequate strength.
- Protect the raceway of the carriage against contamination.

## **Fixing the carriage**

- Carriages must be fixed to the adjacent construction in accordance with the loads and the forces acting on them.

# Fitting and mounting of accessories

For the linear actuators stated in the title, INA offers specially developed accessories, see section Appendix, page 47.

This section shows the fitting of the following accessories:

- coupling
- coupling housing.

## Coupling

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

- Before starting work, disconnect the machine from the power supply.
- Secure the main switch of the machine against switching on.

### Fitting the coupling

- Slide the coupling onto the drive shaft of the drive unit.  
There must be a gap of approx. 2 mm left between the coupling and the bearing cover.
- Fully tighten the fixing screw. The fixing screw and tightening torque will differ according to the coupling used,  
for information see INA publication ALE, Driven Linear Units.



Figure 4

Screw mounting of the coupling

### Removing the coupling

- ✓ Coupling housing removed.
- Loosen the fixing screw.
- Remove the coupling in the direction of the drive shaft.

## Coupling housing

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

- Before starting work, disconnect the machine from the power supply.
- Secure the main switch of the machine against switching on.

## Fitting the coupling housing

✓ Coupling fitted.

- Slide the coupling housing over the coupling.

The ring-shaped raised area on one end face must face towards the support rail.

- Screw mount the coupling housing to the drive unit by means of the fixing screws.
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/9,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M8/23 Nm.

① Holes in the coupling housing

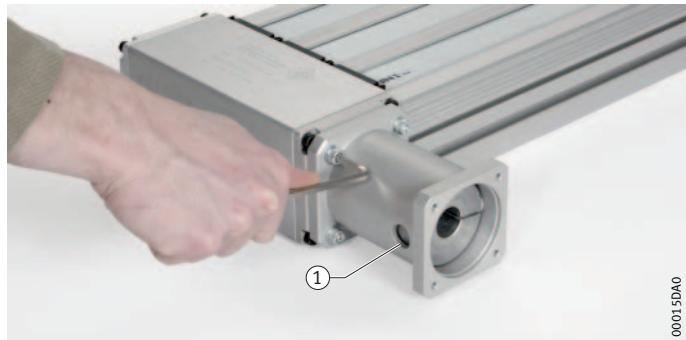
*Figure 5*  
Screw mounting of the coupling

**Note!** The hole in the coupling housing is used to fix and loosen the drive shaft.

## Removing the coupling housing

- Loosen the fixing screws.

- Remove the coupling housing in the direction of the drive shaft.



# Maintenance

## Maintenance requirements

Maintenance work is restricted to:

- relubrication
- cleaning.

Maintenance work may require the removal and refitting of components, see page 22 onwards.

## Visual inspection

In order to ensure exact function and a long operating life of the linear actuator, it must be visually inspected for damage and contamination at regular intervals.

## Maintenance intervals

Maintenance intervals, especially the intervals between relubrication, are influenced by:

- travel speed and drive torque
- load
- temperature
- stroke length
- environmental conditions (cleanliness etc.).

## Maintenance according to operating conditions

It is not possible to calculate all the influences on maintenance intervals. The intervals can therefore only be determined precisely under operating conditions.

### Note!

The interval lengths stated in the following sections are **maximum** maintenance intervals. They must be shortened for each individual case depending on the types of influences present.

## **Relubrication**

Relubrication is necessary for:

- carriages.

The relubrication interval is dependent on the environmental conditions. Relubrication times and quantities can only be determined precisely under operating conditions.

Relubrication must be carried out:

- as a function of the application

This must be determined in accordance with the operating conditions.

- as soon as fretting corrosion<sup>1)</sup> occurs.

1) Fretting corrosion can be identified by a reddish discolouration of the guideway raceways.

**Note!**

If fretting corrosion occurs, the lubrication intervals should definitely be reduced.

**What should be used for relubrication?**

The linear actuator is supplied with an initial greasing of high quality lithium complex soap grease KP2P-35, DIN 51 825.

Relubrication may only be carried out with greases that are miscible with the grease used for initial greasing.

**Note!**

Detailed information on recommended greases can be found in the INA publication ALE, Driven Linear Units. The INA publication can be requested through [info.linear@schaeffler.com](mailto:info.linear@schaeffler.com).

**What is the relubrication quantity?**

Guide values for the required quantity of grease are shown in the table.

**Relubrication quantity for carriages**

Series	Length of carriage	Relubrication quantity for carriage <sup>1)</sup> (guide values) g
MDKUE15-3ZR	240 mm	approx. 4 to 5
	500 mm	approx. 1,6 to 2
MDKUE25-3ZR	365 mm	approx. 8 to 10
	240 mm	approx. 2,5 to 3
MDKUVE15-3ZR	500 mm	approx. 1 to 2
	365 mm	approx. 12 to 14
MDKUSE25-3ZR		

1) Relubrication quantity per lubrication point (lubrication nipple) on one side of the carriage.

**Note!**

It is more advisable to carry out relubrication at several points during the maintenance interval, using partial quantities in each case, than relubrication at the end of the interval using the entire quantity.

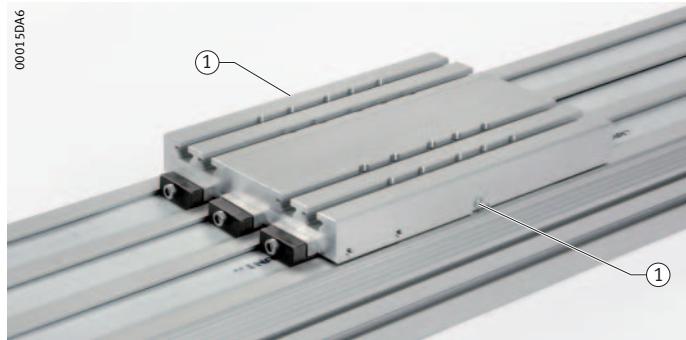
# Maintenance

## Relubrication of carriages

### Funnel type lubrication nipple

The carriage is relubricated via funnel type lubrication nipples to DIN 3 405-A-M6. These are located on the longitudinal sides of the carriage.

The lubrication connector can also be replaced in order to allow connection to a central lubrication system.



① Funnel type lubrication nipple

Figure 6  
Funnel type lubrication nipple

#### Note!

The carriages of length 500 mm and the carriage of the linear actuator MDKUSE25-3ZR have two funnel type lubrication nipples on each longitudinal side.

Relubrication can be carried out from either the left or right side.

#### Warning

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- Before starting work, disconnect the machine from the power supply.
- Secure the main switch of the machine against switching on.
- Linear actuator warm from operation.
- Funnel type lubrication nipples clean and accessible.

### Relubrication of carriages

Carriage with 1 lubrication nipple on each longitudinal side:

- Pump the required lubricant quantity into one of the funnel type lubrication nipples.
- If possible, move the carriage by hand during lubrication in order to distribute the grease evenly.

Carriage with 2 lubrication nipples on each longitudinal side:

- Pump the required lubricant quantity with even distribution into the funnel type lubrication nipples on the same longitudinal side.
- If possible, move the carriage by hand during lubrication in order to distribute the grease evenly.

## **Cleaning**

### **When should cleaning be carried out?**

Cleaning must be carried out if heavy contamination is present. The cleaning requirements are dependent on the environmental and application conditions and can only be determined in the operational state.

### **Cleaning of components after removal**



If components must be removed or the linear actuator must be dismantled, the components should be cleaned before refitting.

Damage due to unsuitable cleaning tools or cleaning agents.

- Do not use pointed, hard or abrasive objects.
- Do not dampen lubricated components during cleaning.
- Do not use abrasives, petroleum spirit, oil etc.

### **What should be used for cleaning?**

Suitable cleaning tools are:

- paint brush
- soft brush
- soft cloths.

# Removal and dismounting of components

## Linear actuator

The linear actuator is dismantled in the following sequence:

- remove the toothed belt, see page 23
- remove the drive unit or return unit, see page 25
- remove the carriage, see page 28.

## Note!

It is only necessary in exceptional cases to completely disassemble the linear actuator.

## Toothed belt unit

The toothed belt unit comprises three toothed belts and six clamping devices. The clamping devices connect the toothed belts to the carriage.

- ① Toothed belt  
Clamping device:  
② Lower clamping piece  
③ Upper clamping piece  
④ Fixing screws  
⑤ Spacer  
⑥ Adjusting screw

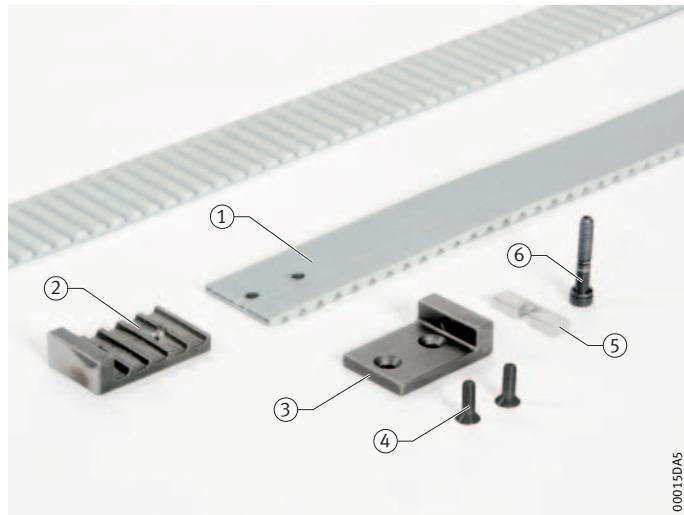


Figure 7

Overview of toothed belt unit

## Warning

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- Before starting work, disconnect the machine from the power supply.
- Secure the main switch of the machine against switching on.

## Removing the toothed belt

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

### Note!

The toothed belts are supplied with a factory-specified preload. If the toothed belts are refitted after removal, they must be set to the same preload as before removal, see page 35.

Detaching the clamping devices from the carriage



Figure 8

Loosening the adjusting screws

- Loosen and remove the adjusting screws on the driven side of the carriage.
- Remove the clamping devices and the spacers from the carriage.
- If the same toothed belts are refitted: Store the spacers carefully and reuse them when fitting the clamping device in order to achieve the original preload.

Detaching the clamping devices from the toothed belt



Figure 9

Loosening the fixing screws

- Loosen and remove the fixing screws of the clamping devices.
- Remove the upper and lower clamping pieces from the toothed belt.

## Removal and dismounting of components

Detaching the clamping devices  
on the return side

- Detach the clamping devices on the return side of the carriage.
- Remove the upper and lower clamping pieces from the two outlying toothed belts.

**Note!**

The clamping device on the central toothed belt must only be removed from the toothed belt if the clamping device itself or the toothed belt must be replaced. Dismounting of the clamping device is not necessary in order to remove the central toothed belt.

Removing the toothed belt

- Grip the end of each toothed belt consecutively and pull it out of the support rail.



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*Figure 10*

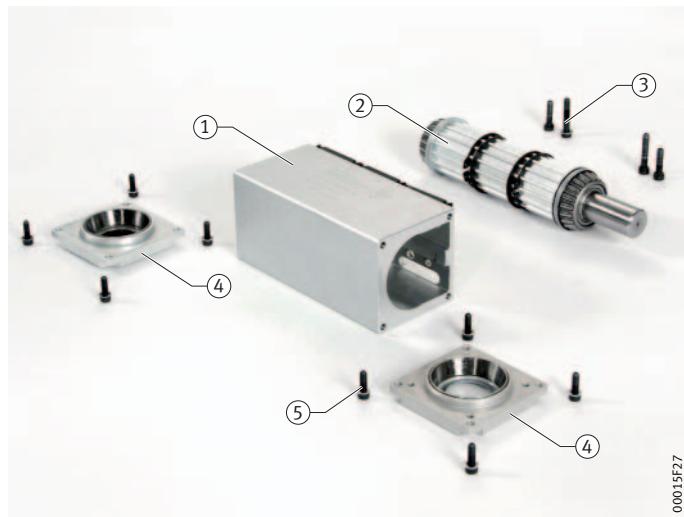
Removing the toothed belt

## Drive and return unit

The drive unit and return unit differ according to the design. However, both components are dismounted in the same way.

- ① Housing
- ② Toothed belt pulley with bearing
- ③ Fixing screws for housing
- ④ Bearing cover
- ⑤ Fixing screws for bearing cover

*Figure 11*  
Overview of drive unit



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### Removing the drive unit or return unit.

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

- ✓ All toothed belts removed, see page 23.
- ✓ In the case of the drive unit:  
Motor, coupling and coupling housing removed, see page 16 and page 17.

#### Removing the toothed belt pulley

- Loosen the fixing screws for one bearing cover on the drive or return unit as appropriate.
- Loosen the bearing cover from the housing and remove it in the direction of the shaft axis.

*Figure 12*  
Removing the bearing cover



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## Removal and dismounting of components

- Remove the toothed belt pulley together with the bearing from the housing.



*Figure 13*

Removing the toothed belt pulley

Removing the housing

- Remove the second bearing cover from the housing.
- Loosen the fixing screws on the housing.



*Figure 14*

Unscrewing the housing

- Remove the housing from the support rail.



*Figure 15*

Removing the housing

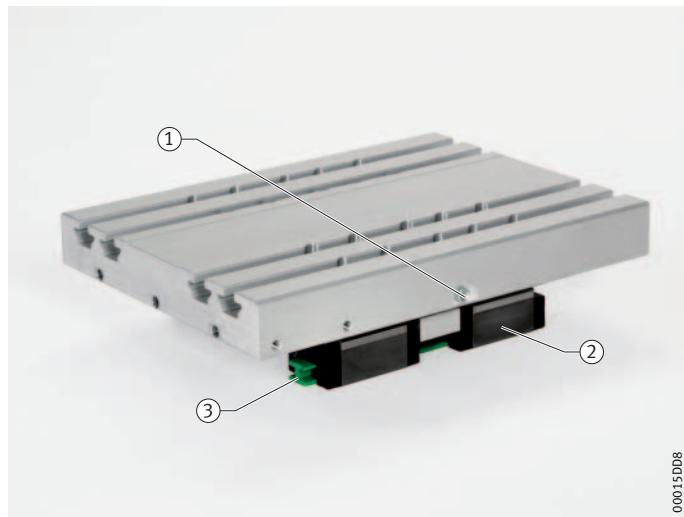
## Carriage

It is only necessary to remove the carriage if it is to be replaced by a new carriage.

Carriages differ according to the design. However, they are all dismounted in the same way.

- ① Funnel type lubrication nipple
- ② Linear recirculating ball bearing and guideway assemblies
- ③ Dummy guideways  
(only required for removal)

*Figure 16*  
Overview of carriage



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Damage due to contaminated grease.

The characteristics of grease may change due to contamination.

- The work area must be cleaned before removing the carriage.
- Elements with grease must be laid only on a clean, lint-free underlay.

# Removal and dismounting of components

## Removal of carriages

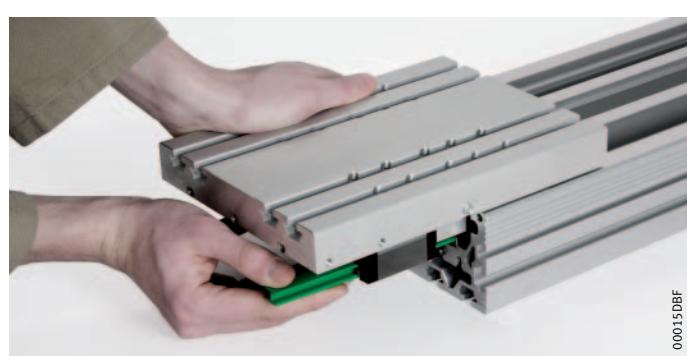
- ✓ Drive unit or return unit removed, see page 25.
- ✓ Dummy guideway clean and dry.



Damage due to incorrect removal.

- ❑ Hold the end faces of the guideways and dummy guideways together ensuring the correct fit.
- ❑ Hold the carriages concentric and parallel to the support rail.
- ❑ Press the dummy guideways flush against the end faces of the guideways.
- ❑ Draw the carriages carefully from the guideway onto the dummy guideways.

### Removing the carriages



00015DBF

*Figure 17*  
Removing the carriages

# Fitting and mounting of components

## Linear actuator

A completely disassembled linear actuator is reassembled in the following sequence:

- slide the carriage into place, see page 29
- insert the toothed belt, see page 30
- fit the return unit, see page 31 to page 32
- fit the drive unit, see page 33 to page 34
- fix the toothed belt to the carriage, see page 34
- preload the toothed belt, see page 35 to page 36
- align the clamping device, see page 36.

## Carriage

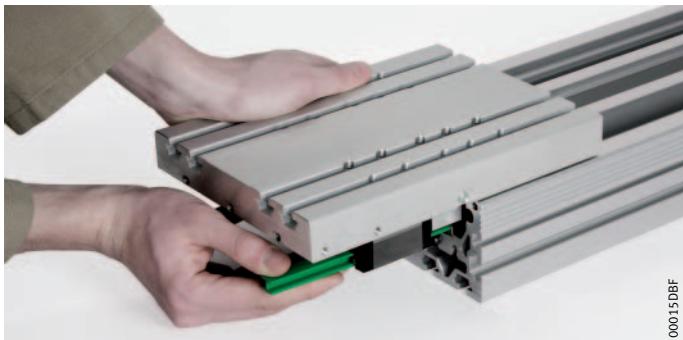
A component overview is shown in *Figure 16*, page 27.



Damage due to incorrect fitting.

- Hold the end faces of the guideways and dummy guideways together ensuring the correct fit.
- Hold the carriages concentric and parallel to the support rail.
- Hold the dummy guideways flush against the end faces of the guideway.
- Slide the carriages carefully from the dummy guideways onto the guideways.

### Sliding the carriage onto the guideway



*Figure 18*  
Sliding the carriages onto the guideways

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# Fitting and mounting of components

## Toothed belt unit

A component overview is shown in *Figure 7*, page 22.

### Overview of fitting

The toothed belts are fitted in 5 steps:

- insert the toothed belt
- fit the return unit
- fit the drive unit
- fix the toothed belt to the carriage
- preload the toothed belt.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

### Note!

If the toothed belts are refitted after removal, they must be set to the same preload as before removal, see page 35.

### Starting point

The following instructions are based on the assumption that both the return unit and the drive unit have been removed, see page 25.

If only one of the two units has been removed, go directly to Fitting the drive unit housing, see page 33. In this case, the instructions also apply for fitting of the return unit.

✓ Carriage slid onto guideway, see page 29.

### Inserting the toothed belt

Insert all the toothed belts into the lower hollow section at the open end of the support rail.

The teeth of the toothed belt must face upwards.



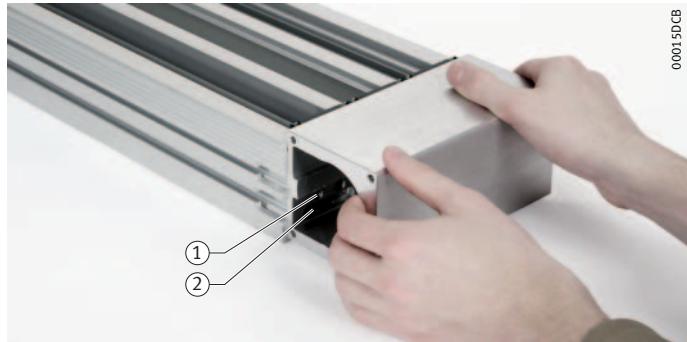
*Figure 19*

Inserting the toothed belt  
in the support rail

Continue inserting the toothed belt until only 2 or 3 teeth protrude from the end of the support rail.

### Fitting the return unit housing

- Locate the return unit housing on the two dowel pins and push it onto the support rail until it stops.  
Ensure that the toothed belts slide through the lower openings into the housing.



① Outlying hole  
② Opening for toothed belt

*Figure 20*  
Locating the housing

- Screw mount the housing to the support rail using fixing screws:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/9,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M8/23 Nm.

**Note!**

Screw the shorter screws into the outlying holes.



*Figure 21*  
Screw mounting of the housing

# Fitting and mounting of components

Inserting the toothed belt pulley

- Insert the toothed belt pulley into the housing and centre it.



Figure 22

Inserting the toothed belt pulley



Inserting the toothed belt

- Damage to the toothed belt and return unit due to unsuitable tools.
- Do not use pointed or sharp-edged tools.

- Feed the central toothed belt into the teeth on the toothed belt pulley with the aid of a screwdriver.  
Hold the screwdriver flat between two teeth on the toothed belt.



Figure 23

Feeding the toothed belt onto the toothed belt pulley

- Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the return unit.
- Insert the two outer toothed belts and pull them approx. 200 mm out of the top of the drive unit.

Closing the housing

- Locate 1 bearing cover on the housing.  
Slide the toothed belt pulley into the cover.
- Screw the bearing cover firmly to the housing:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/5,5 Nm
  - MDKUE25-3ZR, MDKUVE25-3ZR: M8/9,5 Nm.
- Locate the second bearing cover and screw it firmly into place.

### Fitting the drive unit housing

- Draw the toothed belts out of the return unit until their other ends protrude by 2 or 3 teeth from the open end of the support rail.
- Locate the drive unit housing on the dowel pins and push it onto the support rail until it stops. Ensure that the toothed belt slides through the lower opening into the housing.

① Outlying hole  
② Opening for toothed belt

*Figure 24*  
Locating the housing



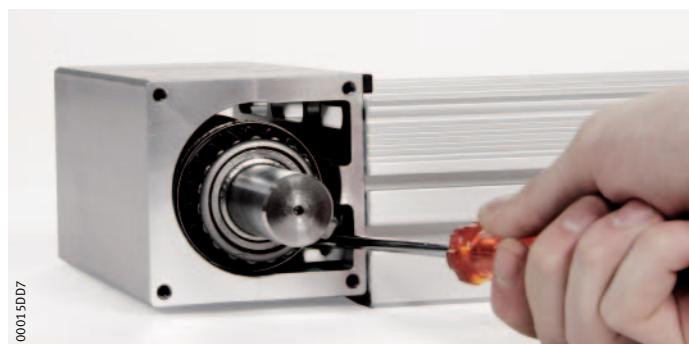
### Inserting the toothed belt

- Screw mount the housing to the support rail using fixing screws:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/9,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M8/23 Nm.
- Screw the shorter screws into the two outlying holes.
- Insert the toothed belt pulley into the housing.

#### Note!

- Feed the central toothed belt onto the teeth of the toothed belt pulley.

*Figure 25*  
Feeding the toothed belt onto the toothed belt pulley



- Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the drive unit.
- Insert the two outer toothed belts and pull them approx. 200 mm out of the top of the drive unit.

## Fitting and mounting of components

### Closing the housing

- ❑ Locate both bearing covers and slide them against the housing.  
If necessary, carefully knock the bearing cover into place using a rubber hammer.
- ❑ Screw the bearing cover firmly to the housing:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/5,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M8/9,5 Nm.

### Attaching the toothed belt to the carriage

- ❑ Align the ends of the toothed belts parallel with each other in the upper channels of the support rail. The toothed belts must lie in the support rail over their whole length. Toothed belts with clamping devices fitted cannot be positioned in the support rail.
- ❑ Position the upper and lower clamping pieces of the clamping devices on the toothed belts and screw them firmly into place:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M5/5,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M5/5,5 Nm.



Figure 26

Screw mounting the clamping device to the toothed belt

- ❑ Screw the clamping devices firmly into place on the return side of the carriage using the adjusting screws:
  - MDKUE15-3ZR, MDKUVE15-3ZR: M6/9,5 Nm
  - MDKUE25-3ZR, MDKUSE25-3ZR: M8/23 Nm.



Figure 27

Screw mounting the clamping device to the carriage

- ❑ Screw mount the clamping device to the driven side of the carriage loosely enough so that the toothed belt is **not yet tensioned**.

**Preloading the toothed belt  
during refitting**

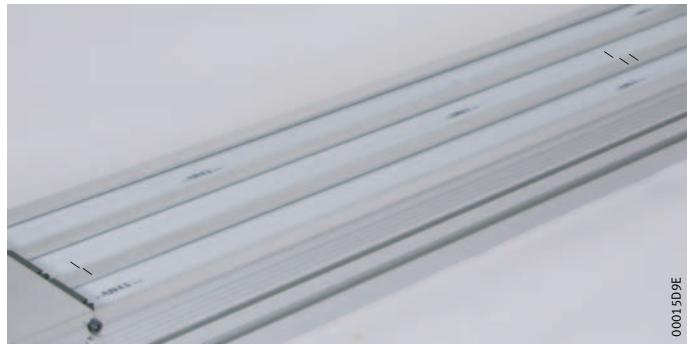
When refitting a toothed belt that has been removed:

- Reinsert the stored spacers between the clamping device and the carriage (driven side).
- Tighten the clamping device with a torque of M8/23 Nm to the hard stop.

**Preloading a new toothed belt**

When fitting a new toothed belt:

- Mark a measurement length of 1 000 mm on the untensioned toothed belt. In order to increase the measurement accuracy, the measurement length can be extended in the case of longer linear actuators (2 000 mm, 3 000 mm etc.).



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*Figure 28*  
Measurement length marked  
(not to scale)

- Tighten the adjusting screw on the driven side of the carriage until the measurement length is extended by the preload elongation. The elongation is as follows:
  - MDKUE15-3ZR, MDKUVE15-3ZR: 1,1 mm/1000 mm
  - MDKUE25-3ZR, MDKUSE25-3ZR: 1,0 mm/1000 mm.



00015D9D

*Figure 29*  
Measurement length preloaded  
(not to scale)

## Fitting and mounting of components

### Inserting the spacers

- Measure the gap between the clamping device and carriage using a vernier.
- Select one spacer corresponding to the width of the gap.  
If a single spacer is not sufficient, select 2 or more spacers that **together** correspond to the width of the gap.
- Insert the spacers between the carriage and the clamping device.
- Tighten the clamping device with a torque of M8/23 Nm to the hard stop.

### Aligning the clamping devices

- Check on both sides of the carriage whether the upper edges of the clamping devices are aligned in parallel.
- If necessary, loosen the adjusting screws and align the clamping devices using a strip of wood or plastic and a rubber hammer.



00015087

Figure 30

Aligning the clamping devices

- Retighten the adjusting screws.

**Drive and return unit**

A component overview is shown in *Figure 11*, page 25.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.

✓ Toothed belt inserted in the profiled section, see page 30.

**Fitting the drive unit or return unit**

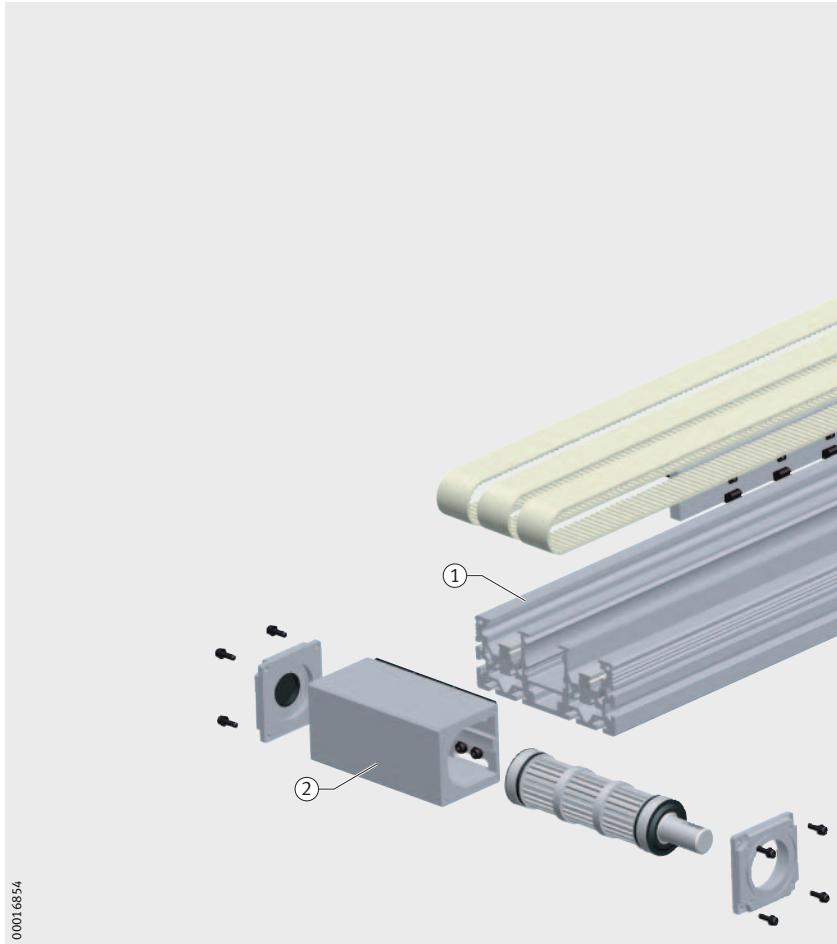
For fitting of the drive unit, see page 33.

For fitting of the return unit, see page 31.

## Variants

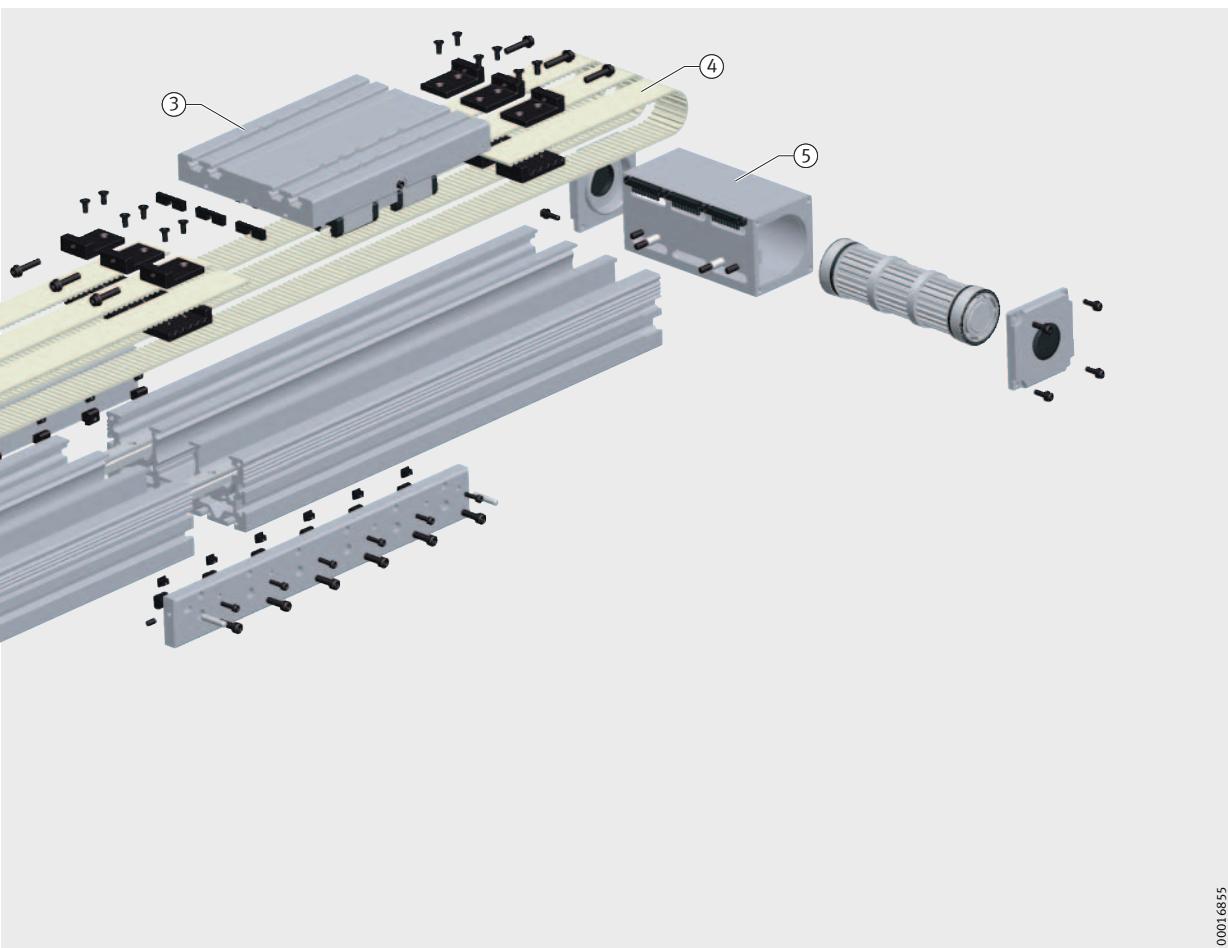
- ① Multi-piece support rail with guideway and retaining plates
- ② Drive unit (return mechanism on drive side)
- ③ Carriage with linear recirculating ball bearing and guideway assemblies
- ④ Toothed belt unit
- ⑤ Return unit (return mechanism on non-driven side)

*Figure 31*  
Subassemblies  
of linear actuator MDKUVE-3ZR,  
multi-piece



### Subassemblies

- Multi-piece support rail with guideway and retaining plates ①, two retaining plates supplied per profile joint.
- Drive unit ②.



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### Subassemblies – continued

- Carriage with linear recirculating ball bearing and guideway assemblies (3).
- Toothed belt unit (4).  
The toothed belt unit comprises three toothed belts and the clamping devices:  
The toothed belts are fixed to the carriage by means of the clamping devices.
- Return unit (5).

# Variants

## Available variants

Carriage	Suffix in ordering designation
2 driven carriages	W2
Support rail	Suffix in ordering designation
Multi-piece	FA517.X <sup>1)</sup>

<sup>1)</sup> X = number of support rail joints.

## Ordering example Design

Series with two-row linear recirculating ball bearing and guideway assembly	MDKUE
Size	15
Length of carriage	500 mm
Drive type: triple toothed belt	3ZR
Drive shaft	RL
Number of carriages	W2
Support rail	FA517.1
Total length of actuator	10 000 mm
Stroke length of actuator	8 686 mm

**Ordering designation** MDKUE15-500-3ZR-RL-W2-FA517.1/10 000-8 686

## Multi-piece support rail

Linear actuators more than 8 m long are supplied in several pieces. They must be assembled before fitting to the adjacent construction.

**Note!** If a delivery includes two or more multi-piece linear actuators, the individual pieces of each actuator are identified by the same letter on the joints of the profiled sections.

**Example** Linear actuator 1: A1, A2, A3, etc.  
Linear actuator 2: B1, B2, B3, etc.

## Assembling the support rail

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.

### Caution

Risk of injury due to falling support rails.

- Ensure that support rails cannot drop from the working area.

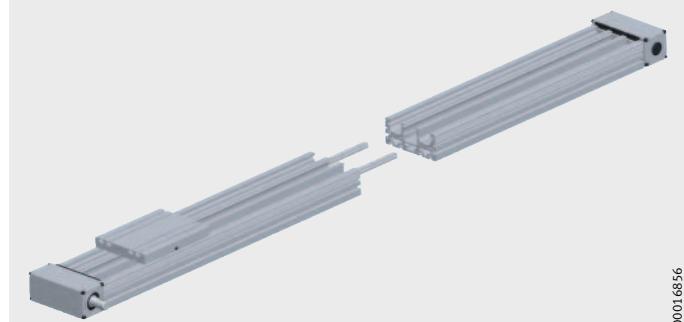
## Positioning of individual pieces

- The individual pieces of the support rail must be arranged consecutively in the correct sequence.  
The combinations of letters and numbers must match,  
see *Figure 33*.

## Example

Correct: profiled section joint A1 – A1

Incorrect: profiled section joint A1 – A2



00016856

*Figure 32*

Arranging the support rails

- Slide the T-nuts for the retaining plates into the T-slots in the sides.
- Slide the individual pieces of the support rail together.



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*Figure 33*

Example of letter and number combination for profiled section

## Variants

### Joining the individual pieces

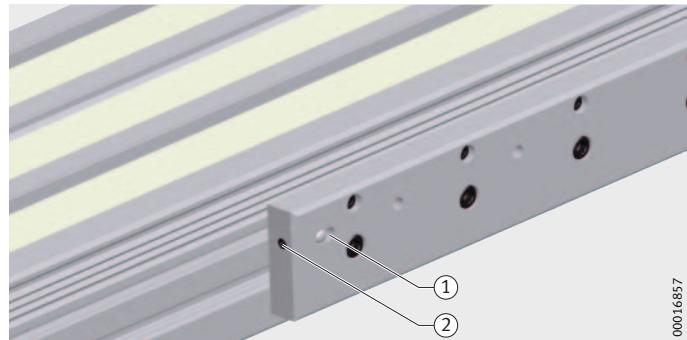
- ❑ Locate the retaining plates at the centre of the profiled section joints using the fixing screws M6.
- ❑ Check whether the guideways in the individual sections abut each other. If necessary, correct the position of the individual pieces.
- ❑ Fix the retaining plates to the support rail by dowels using the two outermost dowel holes. Use the dowel holes in the support rail for this purpose.

#### Note!

The dowel hole at one end of the retaining plate is designed as a slot.

① Slot  
② Grub screw

*Figure 34*  
Slot and grub screw



### Fitting the components

- ❑ Tighten the grub screws at the slots to the abutment point.
- ❑ Check the joint location again.
- ❑ Fasten the fixing screws in the retaining plates to a torque of 9,5 Nm.
- ❑ Drill through the remaining dowel holes in the retaining plates to a diameter 6 H7 approx. 20 mm deep.
- ❑ Knock in the dowel pins.

- ❑ For fitting of further components, see section Fitting and mounting of components, page 29.

## Multiple carriages

If the linear actuator has more than one carriage, these are linked by individual pieces of toothed belt.

### Fitting of multiple carriages

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

✓ All carriages slid onto guideway, see page 29.

### Fixing the toothed belt between carriages

□ Fit short pieces of toothed belt with clamping devices and use these to link the carriages, see page 34.

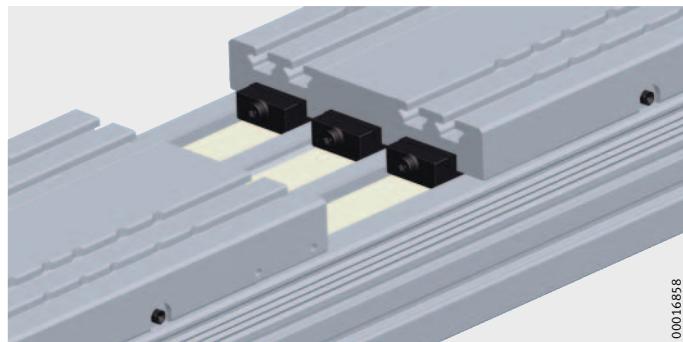


Figure 35

Linking carriages  
using separate piece of toothed belt

### Fitting of toothed belt

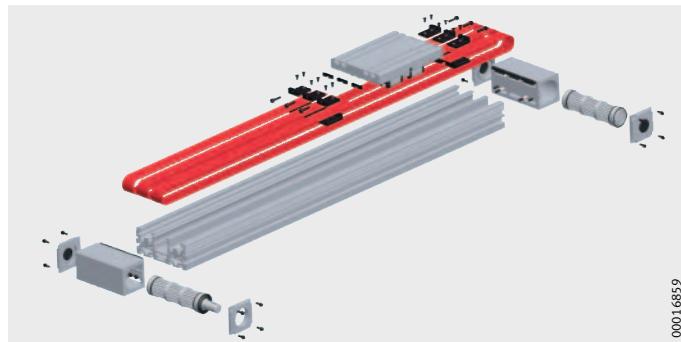
□ Fit the long piece of toothed belt, see page 30 onwards.

# Replacement parts

## Note!

The precise design of your linear actuator is dependent on your order. When ordering replacement parts, please indicate the ordering number of your linear actuator. The ordering number can be found engraved on the drive unit or return unit.

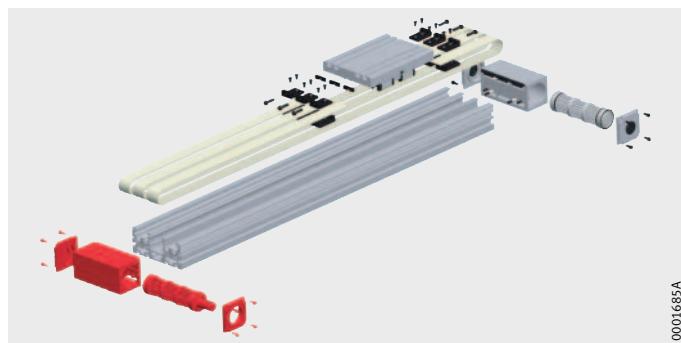
## Toothed belt



### Replacement parts list for toothed belt

Linear actuator	Designation	MATNR
MDKUE15-3ZR	ZHRI40-AT-10	009634940-0000
MDKUE25-3ZR	ZHRI50-AT-10	000255084-0000
MDKUVE15-3ZR	ZHRI40-AT-10	009634940-0000
MDKUSE25-3ZR	ZHRI50-AT-10	000255084-0000

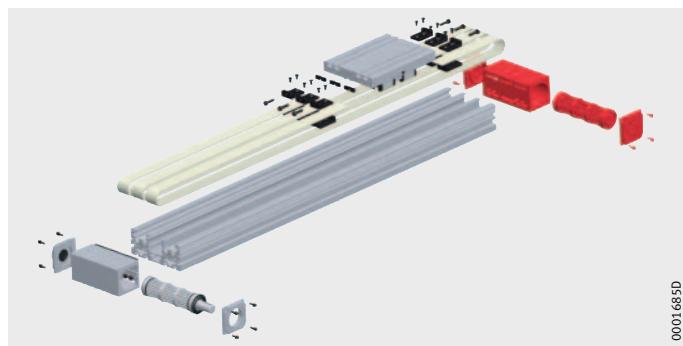
## Drive unit



### Replacement parts list for drive unit

Linear actuator	Designation	MATNR
Drive shaft on left or right side		
MDKUE15-3ZR	UML.MDKUE15-ZR-AR-7500	009635181-0000
MDKUE25-3ZR	UML.MDKUSE25-ZR-AR-7500	006984436-0000
MDKUVE15-3ZR	UML.MDKUE15-ZR-AR-7500	009635181-0000
MDKUSE25-3ZR	UML.MDKUSE25-ZR-AR-7500	006984436-0000
Drive shaft on both sides		
MDKUE15-3ZR	UML.MDKUE15-ZR-RL-7500	009774904-0000
MDKUE25-3ZR	UML.MDKUSE25-ZR-RL-7500	006987265-0000
MDKUVE15-3ZR	UML.MDKUE15-ZR-RL-7500	009774904-0000
MDKUSE25-3ZR	UML.MDKUSE25-ZR-RL-7500	006987265-0000

## Return unit

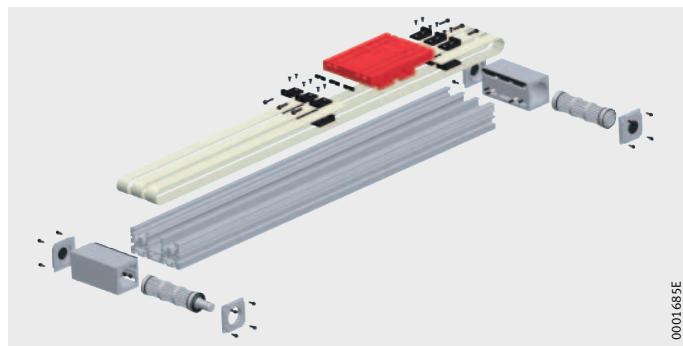


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### Replacement parts list for return unit

Linear actuator	Designation	MATNR
MDKUE15-3ZR	UML.MDKUE15-ZR-7500	009635270-0000
MDKUE25-3ZR	UML.MDKUE25-ZR-7500	009718230-0000
MDKUVE15-3ZR	UML.MDKUVE15-ZR-7500	009635270-0000
MDKUSE25-3ZR	UML.MDKUSE25-ZR-7500	009718230-0000

## Carriage



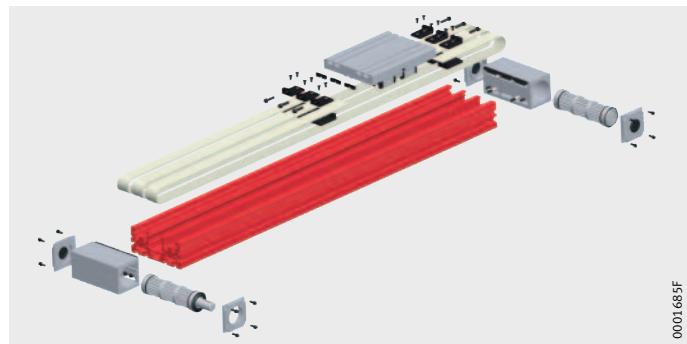
0001685E

### Replacement parts list for carriage

Linear actuator	Designation	MATNR
Carriage length 240 mm		
MDKUE15-3ZR	LAW.MDKUE15-3ZR-4400	009629890-0000
MDKUVE15-3ZR	LAW.MDKUVE15-3ZR-4400	006990754-0000
Carriage length 365 mm		
MDKUE25-3ZR	LAW.MDKUE25-3ZR-4400	005099749-0000
MDKUSE25-3ZR	LAW.MDKUSE25-3ZR-4400	006984118-0000
Carriage length 500 mm		
MDKUE15-3ZR	LAW.MDKUE15-500-3ZR-4400	009774785-0000
MDKUVE15-3ZR	LAW.MDKUVE15-500-3ZR-4400	005810540-0000

## Replacement parts

### Support rail



001685F

#### Replacement parts list for support rail

Linear actuator	Designation	MATNR
MDKUE15-3ZR	MTKD.MDKUE15-ZR-5400	009630023-0000
MDKUE25-3ZR	MTKD.MDKUE25-ZR-5400	005099366-0000
MDKUVE15-3ZR	MTKVD.MDKUVE15-ZR-5500	006988717-0000
MDKUSE25-3ZR	MTKSD.MDKUSE25-ZR-5600	009719601-0000

# Appendix

## Accessories

Special INA replacement parts have been developed for the linear actuators. These ensure the reliable and long term function of the linear actuators.

Location	Accessory	Article number
	Clamping lugs <sup>1)</sup>	SPPR28×30
	Fixing brackets <sup>1)</sup>	WKL48×35
		WKL98×35
	T-strips (steel)	Leis-M6-T-Nut
		Leis-M8-T-Nut
	T-nuts	MU-DIN508-M4×8
		MU-DIN508-M6×8
		MU-M4×8-Rhombus
		MU-M6×8-POS
		MU-M6×8-Rhombus
		MU-M8×8-POS
	T-bolts	SHR-DIN787-M8×8×32
	Slot closing strips	NAD5×5,7
		NAD8×11,5
	Connecting brackets	See INA publication Fasteners and connecting brackets for linear actuators (TPI 153)

<sup>1)</sup> Clamping lugs can support higher forces.  
They should be used in preference over fixing brackets.

## Appendix

### Coupling, gearbox, motor

As a system supplier, the Schaeffler Group also offers components including coupling housings, couplings, gearboxes and motors. These components are precisely matched to the linear actuators.

### Possible combinations for MDKUE15-3ZR, MDKUVE15-3ZR

Coupling housing	Coupling	Gearbox	Motor
KGEH15/43100-MDKUVE-ZR	KUP-KM170-25H7-25H7	PL 115	MOT-SMH100 MOT-SMHA100-BR MOT-MH105 MOT-MHA105-BR
		PLE120/115	MOT-SMH100 MOT-SMHA100-BR MOT-MH105 MOT-MHA105-BR
KGEH15/43000-MDKUVE-ZR	KUP560-66-25H7-25H7	PL 115	MOT-SMH100 MOT-SMHA100-BR MOT-MH105 MOT-MHA105-BR
		PLE120/115	MOT-SMH100 MOT-SMHA100-BR MOT-MH105 MOT-MHA105-BR
KGEH32/43100-MLF-ZR	KUP560-56-20H7-25H7	PL 90	MOT-SMH82 MOT-SMHA82-BR
		PLE80/90	MOT-SMH82 MOT-SMHA82-BR

### Possible combinations for MDKUE25-3ZR, MDKUSE25-3ZR

Coupling housing	Coupling	Gearbox	Motor
KGEH25/43100-MDKUE-ZR	KUP-KM400-32H7-25H7	PL 115	MOT-SMH100 MOT-SMHA100-BR MOT-MH105 MOT-MHA105-BR

Comprehensive information can be found in INA publication ALE, Driven Linear Units and on the Internet at [www.schaeffler.com](http://www.schaeffler.com).

## Tightening torques

The correct tightening torques are shown in the table.

Screw	Grade	Tightening torque Nm
M4	8.8	2,7
	10.9	4,3
	12.9	5,1
M5	8.8	5,5
	10.9	8,4
	12.9	10,2
M6	8.8	9,5
	10.9	14,7
	12.9	17,6
M8	8.8	23
	10.9	35,3
	12.9	42,2
M10	8.8	46
	10.9	67
	12.9	78
M12	8.8	80
	10.9	115
	12.9	135

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